

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

042H



Application of:)
FRANK M. SIMONUTTI, et al)
Serial No. 09/760,431) METHOD OF MAKING A GOLF BALL
Filed: January 12, 2001) PRODUCT WITH A COVER MADE FROM
FAST-CURING REACTION INJECTION
MOLDED POLYURETHANE

DECLARATION UNDER 37 C.F.R. §1.132

I, Frank Simonutti, declare as follows:

1. I am one of the applicants of this application.
2. I have read Lutz Patent No. 5,849,168, which is one of the references which the Examiner used to reject the claims of this application. Lutz describes a method of in-mold coating of golf balls. Lutz defines the term "coating" in column 4, lines 47-52:

"As used herein, the term 'coating' means a material applied to the outer surface of a golf ball cover which may be opaque or transparent, i.e., known as a 'clear coat', which may impart a glossy or shiny appearance to the ball and which may provide some measure of protection and/or durability to the cover of the ball."

3. Lutz's definition of "coating" is consistent with the meaning of that term in the golf ball industry. A golf ball typically includes as its structural components a core and a

cover. The cover has a dimpled surface for providing aerodynamic properties. Some one-piece golf balls include a homogeneous body which does not include a separate core and a separate cover. The outer surface of such a one-piece golf ball is dimpled. Other multi-layer golf balls include a core and two or more cover layers or a mantle and one or more cover layers. In each case the outer cover layer is dimpled. For all such golf balls, a coating may be applied to the dimpled outer surface of the cover to provide gloss and/or color to the outer surface of the cover.

4. The cover of a golf ball is a structural component which provides, inter alia, durability, resilience, and aerodynamic dimples. As described on pages 1-7 of this application, golf ball covers have historically been made from many materials, including balata, ionomers, other thermoplastic materials including polyurethane, and thermoset materials including polyurethane. The cover material is molded or cast over the core or mantle layer to provide the complete golf ball, which includes the cover.

5. After the golf ball is formed by molding or casting the cover, the golf ball is generally provided with one or more coatings to provide color and/or gloss to the outer surface of the cover. This is explained, for example, in Proudfit Patent No. 5,000,458 and Shapiro Patent No. 5,785,612, which are attached as exhibits A and B.

6. Proudfit describes in columns 1 and 2 the use of

clear coat which includes an optical brightener. In each case the coatings are applied to the outer surface of a golf ball cover. Column 3, lines 26-28 describe an outermost clear coat which consists of a two-component urethane.

7. Shapiro describes a golf ball which includes a coat of paint over the golf ball cover and a logo or identifying number formed from ultraviolet curable ink.

8. The coatings of golf balls are usually applied by spray guns, see, for example, column 4, line 10 to column 6, line 3 of Shapiro.

9. The Lutz reference which was cited by the Examiner to reject the claims of this application describes a coating which is applied to the outer surface of a golf ball cover. As previously discussed, Lutz specifically defines the term "coating" as a material which is applied to the outer surface of a golf ball cover. The coating which is described in Lutz is therefore not a golf ball cover but is a separate component which is applied to the golf ball cover.

10. The distinction between a golf ball cover and a golf ball coating is made clear by the disclosure of Lutz. Columns 1 and 2 describe conventional golf balls which include a cover and a core. Column 2, beginning at line 33, describes prior art coatings which are used to provide gloss and enhanced appearance. Column 2, lines 52-53 state that in-mold coating of substrates is known, but has never before been used to coat golf balls. The Summary of the Invention states that "the present

invention is directed to a process for in-mold coating of golf balls. The phrase 'in-mold coating', as used herein, refers to the application of a coating material to a golf ball while the ball is in a mold." Column 4, line 66 to column 5, line 4 states that the "in-mold coating materials appropriate for use in the present invention include any thermoplastic or thermosetting resin suitable for use with one or more of the conventional golf ball cover materials such as balata, ionomers, including acrylic and methacrylic acid based ionomers, urethanes, styrenes and olefinic polymers, to name but a few." Column 7, lines 14-38 describe the preferred embodiment of the method in which a golf ball cover is molded to form a golf ball and then a golf ball coating material is introduced into the mold to coat the outer surface of the golf ball cover.

11. The terms "cover" and "coating" have well-accepted meanings in the golf ball art. The term "cover" refers to the outer layer of relatively hard material which is usually formed of balata, ionomers, or polyurethane. The cover has dimples formed therein to provide aerodynamic properties, and the properties of the cover are selected to provide desired physical properties of the golf ball such as hardness, resilience, distance, spin rate, feel, and sound. The term "coating" means a material which is applied in a relatively thin layer to the dimpled outer surface of the golf ball cover. The coating may affect the appearance of the golf ball but is not considered as affecting the physical properties of the golf ball such as

hardness, resilience, distance, spin rate, feel, and sound.

12. In the golf ball industry the term "golf ball" is used to refer to the core and the molded cover which has dimples formed therein whether or not the outer surface of the golf ball cover has a coating. The coating is used primarily to provide improved appearance and consumer acceptance. Many golf ball manufacturers test golf balls for physical properties without first applying a coating to the outside cover of the golf ball because the coating does not affect the measurements of the physical properties.

13. The use of the term "golf ball" to refer to the product with the dimpled outer surface without a coating is exemplified by Lutz. For example, column 3, lines 20-21 and lines 59-61 refer to "the application of a coating material to a golf ball". Column 4, lines 4-5 refer to forming a golf ball suitable for coating. Column 7, lines 15-25 refers to the process of molding a golf ball suitable for coating. The two independent claims describe a method of applying a "coating material to an outer dimpled surface of a golf ball".

14. The Examiner has referred to the disclosure of Lutz of mixing a polyurethane prepolymer and a curing agent to form a thermoset reaction mixture, injecting the reaction mixture into the mold to cover the golf ball product therein, allowing the reaction mixture to gel and form a golf ball, and opening the mold and removing the golf ball after the injecting step. However, that disclosure of Lutz relates to forming a coating on

the outer surface of the golf ball cover and does not disclose or suggest forming a golf ball cover from a thermoset reaction mixture. It would not have been obvious from Lutz to form a golf ball cover from a thermoset reaction mixture. Contrary to the Examiner's statement, the coating does not form the golf ball. Rather, the coating is applied after the golf ball is formed by molding the dimpled cover over the core.

15. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Dated: 12/15/03


Frank M. Simonutti

United States Patent [19]

Pr udfit

[11] Patent Number: 5,000,458

[45] Date of Patent: Mar. 19, 1991

[54] GOLF BALL WITH OPTICAL BRIGHTENER
IN THE PRIMER COAT

[75] Inventor: James R. Proudfit, Humboldt, Tenn.

[73] Assignee: Wilson Sporting Goods Co., River
Grove, Ill.

[21] Appl. No.: 511,462

[22] Filed: Apr. 20, 1990

[51] Int. Cl.⁵ A63B 37/12

[52] U.S. Cl. 273/235 A; 273/213

[58] Field of Search 273/235 R, 235 A, 235 B,
273/213, 218, 233, 234, 22, 24

[56]

References Cited

U.S. PATENT DOCUMENTS

4,679,794	7/1987	Yamada et al.	273/235 R
4,679,795	7/1987	Melvin et al.	273/235 R
4,798,386	1/1989	Berard	273/235 R
4,802,674	2/1989	Kitaoh	273/235 A
4,865,326	9/1989	Isaac et al.	273/235 A

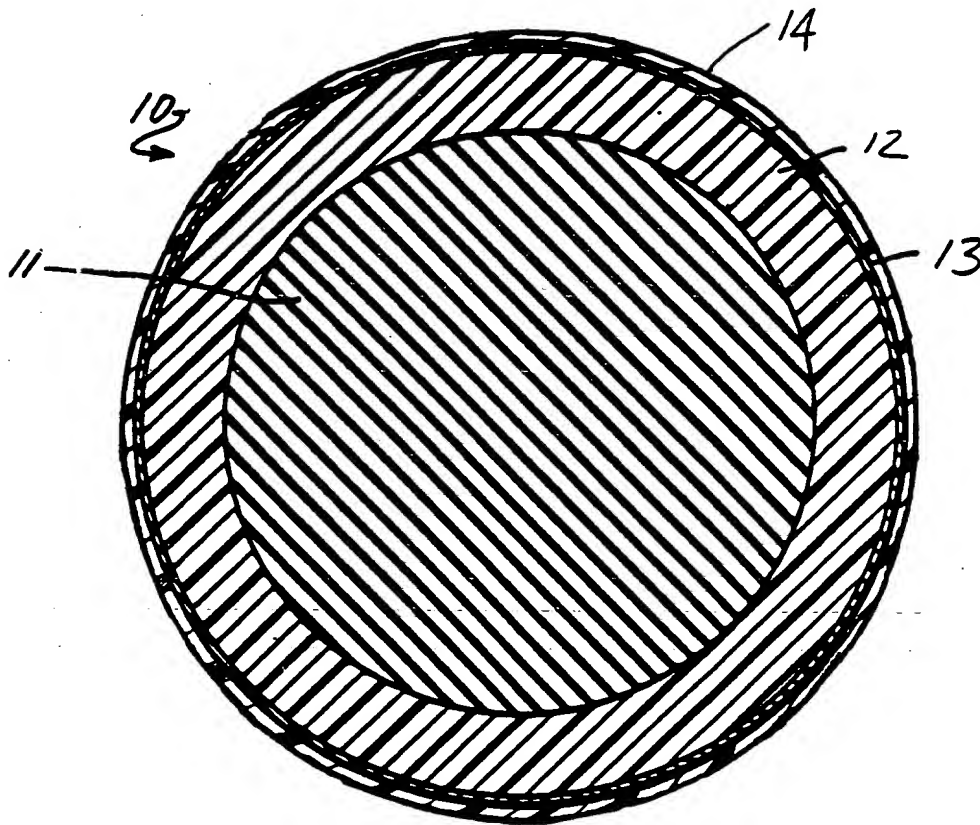
Primary Examiner—George J. Marlo

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ABSTRACT

A golf ball consists of a core and a cover. A transparent primer coat is applied over the cover, and a transparent outermost clear coat is applied over the primer coat. The primer coat contains an optical brightener in the amount of about 0.45 to 2.7% by weight of the solids content of the primer coat.

8 Claims, 1 Drawing Sheet



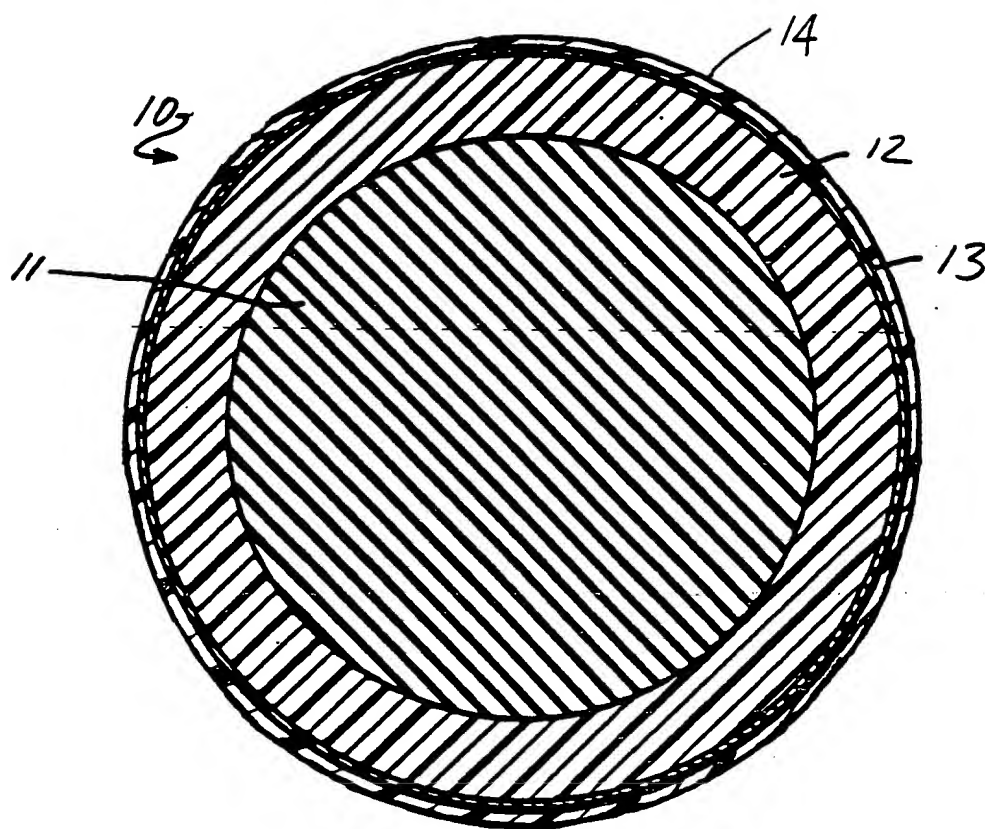


FIG. 1.

GOLF BALL WITH OPTICAL BRIGHTENER IN THE PRIMER COAT

This invention relates to a golf ball with optical brightener in the primer coat.

U.S. Pat. No. 4,679,795 describes incorporating an optical brightener in the cover. The cover also includes white pigment and may include a blue pigment or bluing agent such as Ultramarine Blue. A glossy finish is applied to the ball by coating the cover with a clear epoxy primer followed by an outermost clear coat of urethane. The primer coat and the outermost clear coat are transparent, and the color of the ball is molded into the cover.

U.S. Pat. No. 4,798,386 describes incorporating a fluorescent pigment or dye in the cover. The patent also describes applying a transparent coating over the cover.

U.S. Pat. No. 4,865,326 states that a golf ball can be made at less cost by incorporating optical brightener in the outermost clear coat rather than the cover. Less optical brightener is required in the clear coat than in the cover, and the patent states that results comparable to those obtained with optical brightener incorporated in the cover have been obtained with as little as 0.25 grams of optical brightener per 1000 golf balls. The optical brightener in the outermost clear coat can range between 0.3% to 2% or more by weight of the resin solids in the clear coat. The patent also states that incorporating the optical brightener in the clear coat improves the appearance of the ball because with balls containing an optical brightener the clear coat detracts from the brightness of the ball. Example V states that applying a clear coating to a ball with optical brightener in the cover reduced the SIVR brightness rating from 10 to 3.

Wilson Sporting Goods Co., the assignee of this invention, has sold golf balls under the name Ultra which have a distinctive bluish white color. Such Ultra balls were made by incorporating a white pigment, a blue pigment, and an optical brightener in a Surlyn cover. The molded cover was coated with a transparent primer coat and an outermost transparent clear coat. The cover contained about 99% by weight of Surlyn, 0.053% by weight of Uvitex OB optical brightener, and 0.007% by weight of Ultramarine Blue pigment. The primer coat consisted of an epoxy/acrylic/urethane resin system. The outermost clear coat consisted of a solvent based urethane paint system. It is believed that the optical brightener in the cover absorbs light in the ultraviolet range and emits light in the blue visible range and cooperates with the Ultramarine Blue in the cover to provide the distinctive bluish white color.

If the optical brightener is incorporated in the outermost clear coat of the Ultra ball rather than the cover, the same desirable bluish white color is not obtained. It is believed that this is caused by separating the optical brightener and the blue pigment. Also, when the optical brightener is in the outermost clear coat, the optical brightener is subject to wearing and scuffing as the ball is played, and the appearance of the ball is not as durable as when the optical brightener is molded into the cover.

SUMMARY OF THE INVENTION

I have found that the desirable bluish white color of the Ultra golf ball can be retained even though the optical brightener is omitted from the cover by adjust-

ing the amount of white and blue pigment in the cover and by incorporating the optical brightener in the primer coat. The amount of optical brightener in the primer coat is less than the amount which was molded into the cover, which reduces the cost of the ball, and the resulting ball has improved weatherability. The resulting ball is more durable than a ball which has optical brightener in the clear coat because scuffs in the clear coat will not affect the primer and the optical brightener therein. Contrary to the teaching of Pat. No. 4,865,326, which teaches that optical brightener should be incorporated in the outermost clear coat because the clear coat otherwise reduces the brightness of the ball, incorporating the optical brightener in the primer with adjusted white and blue pigment levels in the cover provides a bright bluish white ball with a more durable appearance. Such a ball can also be used in a UV cure system for the outermost clear coat because the optical brighteners in the primer will not interfere with the UV cure photoinitiator in the clear coat.

DESCRIPTION OF THE DRAWING

The invention will be explained in conjunction with an illustrative embodiment shown in the accompanying drawing, in which:

FIG. 1 is a cross sectional view of a golf ball which is formed in accordance with the invention.

DESCRIPTION OF SPECIFIC EMBODIMENT

Referring to the drawing, a golf ball 10 includes a core 11 and a cover 12. The cover is coated with a transparent primer coat 13 and 14 outermost clear coat or finish coat 14. The drawing is not to scale, and the thicknesses of the primer coat and the clear coat may be exaggerated for clarity of illustration.

The core 11 can be either a solid molded core of one or more layers or a two-piece, wound core which consists of a solid or liquid-filled rubber center and a layer of elastic windings which are wound about the center. The cover can be formed from balata, or synthetic polymeric material such as urethane or ionomeric resins such as Surlyn, and ionic copolymer available from E.I. DuPont de Nemours & Co. Ionomeric covers can consist of either single type ionomer or a blend of two or more ionomers. Solid and wound cores and balata and Surlyn covers are well known in the art, and a detailed description thereof is unnecessary.

The cover can be injection molded about the core or can be formed from two hemispherical half shells which are compression molded about the core. Suitable dimples are molded into the cover during the molding operation.

The cover includes a white pigment such as TiO_2 or ZnO and preferably also includes a blue pigment or bluing agent such as Ultramarine Blue. The white pigment can consist of about 0.50 to 10.0% by weight of the cover, and the blue pigment can consist of about 0.002 to 0.05% by weight of the cover. The polymeric material can consist of about 90.0 to 99.0% by weight of the cover.

The primer coat 13 is preferably a waterborne epoxy/acrylic/urethane resin system and includes an optical brightener. An optical brightener is a material which absorbs light in the ultraviolet range and emits in the blue range of visible light. A typical brightener for use in an aqueous primer system is Tinopal S F P, family name: Triazinol Benzenedisulfonic Acid derivative.

Chemical name:

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2,2'-(1,2-Ethenediylbis((3-Sulfo-4,1-Phenylene)Imino(6-(Diethylamino)-1,3,5-Triazine-4,2-Diyl)Imino))Bis1,4-Benzenedisulfonic Acid, Hexasodium Salt

It is understood that the primer coat 13 can also be a solvent-based primer system and include an optical brightener. Typical optical brighteners for use in this type of system include, Uvitex OB which is available from Ciba-Geigy Chemical Co., Leucopure EGM from Sandoz, Phorwhite K-2002 from Mobay Chemical Corp., and Eastobrite OB-1 from Eastman Chemical Products, Inc. Other optical brighteners and the chemical formulas of optical brighteners are described in U.S. Pat. Nos. 4,679,795 and 4,865,326. Those descriptions of optical brighteners and the chemical formulas thereof are incorporated herein by reference.

The primer coat 10 is preferably optically transparent and is free or essentially free of pigment. The amount of optical brightener may be about 0.45 to 2.7% by weight of the solids content of the primer coat, and preferably about 1.8 to 2.5% by weight.

White or other pigments or dyes can be added in suitable quantities with the optical brightener to the primer coat 13 while maintaining a desirable blue white appearance.

The outermost clear coat 14 preferably consists of a solvent two component urethane paint system, although other systems can easily be used. The clear coat is optically transparent and is free or essentially free of pigment. Trace amounts of optical brightener have traditionally been included in the top coat, and this practice may be continued with the invention. By "trace amounts" I mean an amount of optical brightener that is no more than about 0.04% by weight of the solids content of the top coat.

The blue-white color of the cover is visible through the transparent primer coat 13 and clear coat 14, and the blue-white color is enhanced by the optical brightener in the primer coat. The optical brightener in the primer coat is protected by the clear coat, and the optical brightener remains unaffected if the clear coat is scuffed.

Golf balls made in accordance with the invention can be cured in a ultraviolet (UV) cure system in which the outermost clear coat containing a UV photoinitiator is

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cured with UV light. The UV light cross links the clear coat in a very short time, e.g., about 25 to 30 seconds, compared to the much longer cure time, e.g., about four hours, that a two component system requires. A UV cure system permits balls to be finished and packaged faster and reduces labor and scrap. I have found that if the outermost clear coat uses optical brightener in the levels described in Pat. No. 4,865,326, the optical brightener can inhibit UV curing. The details of UV curing are known in the art, and a detailed description thereof is unnecessary.

While in the foregoing specification a detailed description of a specific embodiment of the invention was set forth for the purpose of illustration, it will be understood that many of the details herein given may be varied considerably by those skilled in the art without departing from the spirit and scope of the invention.

I claim:

1. A golf ball comprising a core and a cover, the cover having a transparent primer coat and an outermost transparent clear coat, the primer coat having an optical brightener admixed therein, the optical brightener constituting about 0.45 to 2.7% by weight of the solids content of the primer coat.

2. The golf ball of claim 1 in which the optical brightener constitutes about 1.8 to 2.5% by weight of the solids content of the primer coat.

3. The golf ball of claim 1 in which the clear coat is optically clear and contains no more than trace amounts of optical brightener.

4. The golf ball of claim 1 in which the primer coat is a waterborne paint system.

5. The golf ball of claim 4 in which the cover is essentially free of optical brightener.

6. The golf ball of claim 1 in which the primer coat is a solvent based paint system.

7. The golf ball of claim 6 in which the cover is essentially free of optical brightener.

8. The golf ball of claim 1 in which the cover comprises from about 90.0 to 99.0% by weight of polymeric material, from about 0.50 to 10.0% by weight of white pigment, and from 0.002 to 0.05% by weight of a bluing agent.

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United States Patent [19]

Shapiro et al.

[11] Patent Number: 5,785,612

[45] Date of Patent: Jul. 28, 1998

[54] GOLF BALL

[75] Inventors: Neil A. Shapiro, Jackson; Marc E. Welch; Dwaine Phillips, both of Humboldt, all of Tenn.

[73] Assignee: Wilson Sporting Goods Co., Chicago, Ill.

5,018,742 5/1991 Isaac .
5,029,870 7/1991 Concepcion .
5,156,405 10/1992 Kitaoh .
5,160,536 11/1992 Harris .
5,200,438 4/1993 Fujii .
5,300,325 4/1994 Nealon .
5,409,233 4/1995 Kennedy .
5,461,109 10/1995 Blair .
5,542,680 8/1996 Proudfit et al. 40/327

[21] Appl. No.: 632,891

[22] Filed: Apr. 16, 1996

[51] Int. Cl.⁶ A63B 37/14

[52] U.S. Cl. 473/377; 473/378; 40/327

[58] Field of Search 40/327; 473/378, 473/373, 374, 377

FOREIGN PATENT DOCUMENTS

60-109657 8/1985 Japan .
61-16885 10/1986 Japan .

Primary Examiner—George J. Marlo

[57] ABSTRACT

A golf ball consisting of a core, a cover, and a single coat of solvent-based transparent paint in contact with the cover, the coat of paint being the outermost coat of the golf ball and including an optical brightener, and indicia on the single coat of paint, the indicia comprising UV cured ink, which is chemically bonded to the coat of paint, the indicia being free of any protective coating.

[56] References Cited

U.S. PATENT DOCUMENTS

4,679,794 7/1987 Yamada .
4,679,795 7/1987 Melvin .
4,798,386 1/1989 Berard .
4,802,674 2/1989 Kitaoh .
4,865,326 9/1989 Isaac .
5,000,458 3/1991 Proudfit .

1 Claim, 1 Drawing Sheet

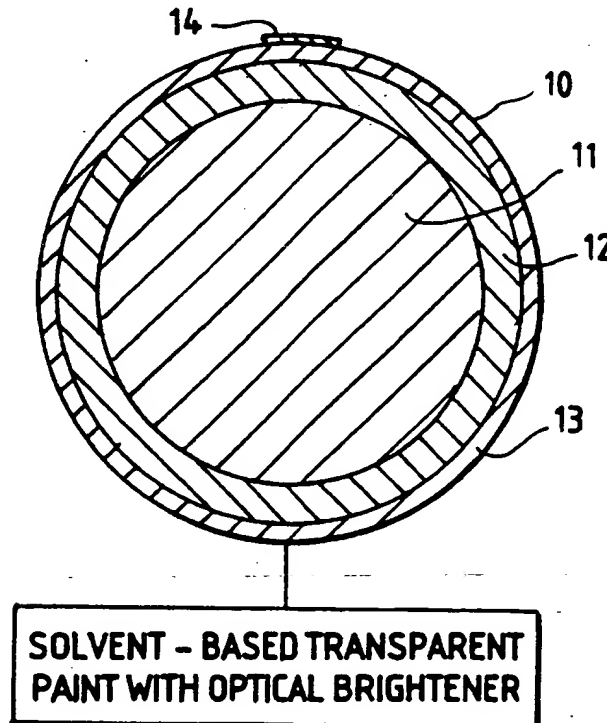


FIG. 1

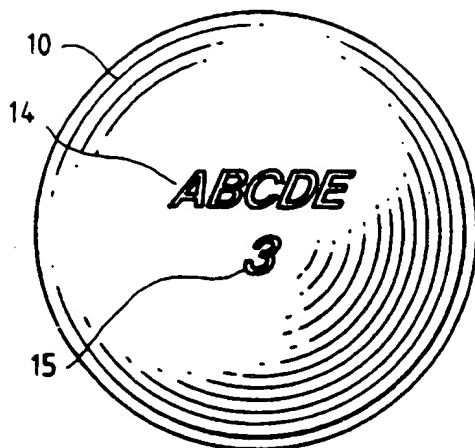


FIG. 2

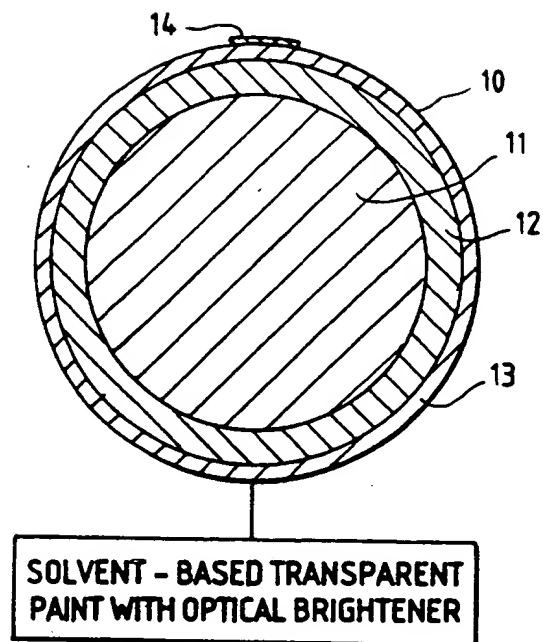


FIG. 3 PRIOR ART

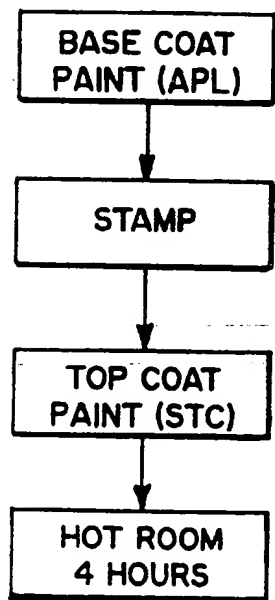
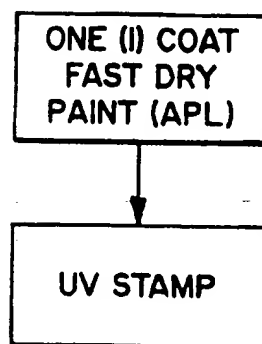


FIG. 4



GOLF BALL

BACKGROUND

This invention relates to golf balls, and, more particularly, to a golf ball which includes only one coat of paint and a stamp of UV cured ink.

Golf balls conventionally include a core and a cover. The core can be a one-piece solid core or a two-piece core which includes a liquid or solid center and a layer of elastic windings. The cover can be formed from natural or synthetic balata or from synthetic polymeric material such as urethane or ionomeric resins such as Surlyn, which is an ionic copolymer resin available from E. I. DuPont de Nemours & Co., and Iotek, which is an ionic copolymer resin available from Exxon.

Historically, golf balls were finished with two or more coats of white opaque paint, which provided the balls with the desired white color. The first coat of paint is a primer coat, which is applied to provide adhesion to the cover. The primer coat is covered with one or more additional coats of white paint, and one or more clear coats of urethane or epoxy are applied as finish coats.

U.S. Pat. No. 4,679,795 describes incorporating white pigment and an optical brightener in the cover and eliminating the coats of white paint.

Japanese Utility Model Application No. 60-109647 describes a golf ball having a cover which is formed from ionomer resin and which contains a white pigment. The golf ball is coated with a clear paint in which a fluorescent brightener is mixed. Although the application does not specifically describe applying two coats of paint, we believe that the cover was first coated with a layer of primer paint in order to increase the adhesion between the surface of the ionomer resin and the coating of paint with the optical brightener.

A few small manufacturers of golf balls make golf balls which have one coat of UV curable paint applied directly to the cover. The performance of these balls do not meet our standards for acceptable golf balls, and these balls are not commercially significant.

U.S. Pat. No. 5,461,109 describes a water-reducible golf ball coating which can be applied to a Surlyn covered golf ball without a primer coat or an adhesion promoting layer. The coating is formed from two components, and one of the components contains an optical brightener.

U.S. Pat. Nos. 4,865,326 and 5,018,742 describe incorporating optical brightener in the outermost clear coat of a golf ball. All of the balls described in the examples are coated with a first clear polyurethane primer coat and a second or finish clear coat. If optical brightener is used, it is incorporated in the outermost coat. Example VI describes stamping a trademark or other indicia on the ball after the primer coat was applied, and then applying the outermost clear coat. The second paragraph in column 1 explains that stampings are by their nature non-durable, and prior art golf balls typically had one or two clear coats applied over the stampings to protect the stampings.

U.S. Pat. N. 5,000,458 describes incorporating optical brightener in the primer coat and then applying an outermost clear coat or finish coat which does not contain optical brighteners.

SUMMARY OF THE INVENTION

We have discovered that substantial savings can be achieved by applying only one coat of clear paint to the

cover of a golf ball. The paint is a fast drying solvent-based paint which includes an optimum amount of optical brightener. The single coat of clear paint combines the features of the two coats which were previously used—it enhances the white color of the ball through the optical brightener, and it provides good cosmetic appearance. Substantially less optical brightener is required when only one coat is used, and the single coat can be applied by an automatic paint spray line, thereby eliminating manual handling of the balls.

If conventional stamping is used, the stamps are applied to the cover before the single coat of paint. Preferably, the stamping uses a durable UV curable ink which is cured by ultraviolet light. The UV curable ink can be applied either directly to the cover or on top of the single coat of paint. The UV cured ink is durable enough that a protective coat over the stamp is not required.

The UV curable ink can also be used to apply stamps to conventional golf balls which include two or more clear or opaque coats. The stamp can be applied directly to the cover, on top of the primer coat, or on top of the outermost or finish coat.

DESCRIPTION OF THE DRAWINGS

The invention will be explained in conjunction with an illustrative embodiment shown in the accompanying drawing, in which

FIG. 1 illustrates a golf ball which is made in accordance with the invention;

FIG. 2 is a sectional view of the golf ball;

FIG. 3 is a flow chart illustrating a conventional prior art method of processing golf balls; and

FIG. 4 is a flow chart illustrating the inventive method of processing golf balls.

DESCRIPTION OF SPECIFIC EMBODIMENT

Referring to the drawing, a golf ball 10 includes a core 11 and a cover 12. The cover is coated with a single coat 13 of transparent or clear paint. A logo or trademark 14 and an identifying number 15 or other indicia are stamped onto the coat 13.

The core 11 can be conventional, for example, a solid molded core or a two-piece wound core which consists of a solid or liquid-filled center and a layer of elastic windings.

The cover 12 can be formed from natural or synthetic balata or ionomer resins such as Surlyn and Iotek resins.

Such cores or covers are well known in the art, and a detailed description thereof is unnecessary.

The cover can be injection molded about the core or can be formed from two hemispherical half shells which are compression molded about the core. Suitable dimples are molded into the cover during the molding operation.

The cover includes a white pigment such as TiO_2 or ZnO and preferably also includes a blue pigment or bluing agent such as Ultramarine Blue. The white pigment can consist of about 0.50 to 10.0% by weight of the cover, and the blue pigment can consist of about 0.002 to 0.05% by weight of the cover. The polymeric material can consist of about 90.0 to 99.0% by weight of the cover.

The single coat 13 of paint is a faster-drying paint which includes an optical brightener. The preferred paint is a solvent-based two component urethane paint which is available from Dexter Corp. of Waukegan, Ill. The two components are designated 7000A70M and 0300A62M. The paint has a solids content of about 38% by weight, but the solids

content can range from 35 to 45% by weight. The preferred paint does not contain water, but water-based paints could also be used.

Optical brightener is preferably added at a level of about 0.2% by weight of the solids content of the paint. The optical brightener can be added at a level within a range of about 0.05 to 0.25% of the solids content of the paint.

An optical brightener is a material which absorbs light in the ultraviolet range and emits in the blue range of visible light. Optical brighteners for use in the cover or clear coats of golf balls are well known. U.S. Pat. Nos. 5,000,458, 5,018,742, and 4,679,795 describe suitable optical brighteners.

Golf ball covers which are formed from Surlin resins or other ionomer resins have relatively low adhesion. The low adhesion generally requires the cover to be coated with a primer coat before the finish coat is applied. It is believed that the aforementioned paint from Dexter Corp. includes an additive to promote adhesion to the cover. However, we do not know the nature of the additive or the exact formulation of the paint.

The logo 14 and identifying number 15 can be stamped by a conventional pad printing process which transfers ink from a cliché, or image carrier, to the ball by a flexible pad. The pad is conventionally silicone. Conventional stamping ink is thermoplastic in nature and is air dried. If conventional stamping ink is used, the logo and identifying number are preferably stamped directly onto the cover before the paint coat 13 is applied so that the stampings are protected by the layer of paint.

The preferred embodiment of the invention uses a durable ultraviolet (UV) curable ink. The UV ink contains photoinitiators and acrylates from which their curing properties are derived. Acrylates are also referred to on material safety data sheets, of ink suppliers as acrylated epoxy oligomers and acrylated monomers. Pigments may also be included to achieve various colors. UV curable inks are well known in the printing ink business, but the formulations of the inks are not published by the manufacturers. The UV curable ink used in the preferred embodiment was obtained from Trans Tech America, Inc. of Carol Stream, Illinois under the designation UVA Pad Printable Ink.

The UV curing process involves exposing the ink to high intensity UV light to initiate curing. UV curing can be done in-line, with curing equipment mounted on the ball conveying system of the pad printer, or off-line, by placing the balls in trays and conveying them through a remote lamp housing or tunnel by a feed belt.

The UV curing chemically bonds the ink to the cover or to the coat of paint. The ink is dry to the touch immediately after curing and the ball can be handled at that time without damaging the stampings.

The UV curable ink can be printed onto the outer paint coating, and no protective coating is required. The cured ink chemically bonds to the paint and is so durable that a protective coating is unnecessary.

The preferred golf ball includes a single coat of paint and UV cured ink stampings on the outside of the paint coat. However, the UV curable ink can also be used with conventionally painted balls which include a prime coat and one or more additional coats. The UV cured ink is durable enough to be stamped on the outermost coat, but it can also be stamped on the cover, on the primer coat, the first finish coat, etc.

Golf balls which are prepared with a single coat of paint and/or UV curable ink stampings can be manufactured much

more easily and economically. Substantial labor savings are achieved, and a single coat of paint also achieves substantial material savings.

The advantages and economics of using a single coat of paint and/or UV curable ink can be demonstrated by comparing a conventional prior art manufacturing process illustrated in FIG. 3 with the inventive process illustrated in FIG. 4.

Prior Art Ball Finishing Process (FIG. 3)

BASE COAT PAINT (Automatic Paint Line or APL)—In this operation, balls are painted with a water based coat of primer paint. The purpose of this operation is to prepare the balls for stamping and to add the optic color. The balls are automatically loaded from gondolas onto paint spindles. The balls then pass in front of paint guns as the spindles rotate the balls to insure all surfaces of the ball are painted. The balls then travel through a drying (or curing) oven where the paint is allowed to dry. The balls exit the oven and are knocked off into a gondola.

STAMP—In the stamping process, the production logos and/or trademarks and identifying numbers are printed on the balls. The balls are loaded into hoppers from the gondolas and are fed onto a loading conveyor. The logos and numbers are printed by silicone pad transfer using thermoplastic type inks. The balls are then offloaded onto trays and racks.

TOP COAT PAINT (Solvent Top Coat or STC)—In this operation, balls are painted with a solvent based coat of paint. The purpose of this operation is to protect the stamp and to improve the cosmetic appearance of the ball. The balls are manually loaded from the racks and trays onto paint spindles. The balls then pass in front of the paint guns as the spindles rotate the balls to insure all surfaces of the ball are painted. The balls are then manually removed from the spindles and returned to the trays and racks. The balls are then placed into a curing room (110deg. F.) for four hours where the paint is allowed to dry.

New Ball Finishing Process (FIG. 4)

ONE COAT FAST DRY PAINT (Automatic Paint Line or APL)—In this operation, balls are painted with a one coat fast dry paint. The purpose of this operation is to add the optic color and to improve the cosmetic appearance of the balls. The balls are automatically loaded from gondolas onto paint spindles. The balls then pass in front of the paint guns as the spindles rotate the balls to insure all surfaces of the ball are painted. The balls then travel through a drying (or curing) oven where the paint is allowed to dry. The balls exit the oven and are knocked off into a gondola.

UV STAMP—In the stamping process, the production logos and numbers are printed on the balls. The balls are loaded into hoppers from the gondolas and are fed onto a loading conveyor. The logos are printed by silicone pad transfer using UV curable type inks. The ink is cured and the balls are then offloaded into gondolas.

Details of the Prior Art Ball Finishing Process

The painting process involves the precise application of paint to the golf ball. The actual process equipment is a spray painting booth.

Traditionally, two or more coats of paint are applied to the ball. The first coat of paint is a water based primer. This primer prepares the balls for stamping and adds the optic color for cosmetic purposes. The optical brightener is at a

level of about 2% by weight of the solids content of the primer. The primer is applied in the APL area in a setup where the balls are automatically loaded from gondolas onto spindles. The ball and spindle pass in front of the paint guns as the spindle rotates to insure all surfaces of the ball are painted. Approximately 120 milligrams of wet paint are applied to each ball. The balls then travel through a drying (or curing) oven where the paint is allowed to dry. The drying process takes about 4 minutes. After the balls exit the oven, they are off loaded into gondolas. The balls are then typically sent through the stamping process.

After stamping, the top coat of paint is applied to the ball. The actual application of the paint is very similar to the primer coat of paint. However, there are some major differences in the process. The balls must be handled manually due to the nature of the stamping ink and its lack of durability. The balls are loaded manually onto spindles instead of automatically and they are manually removed from the spindles so they can be placed into a curing room for four hours at a temperature of 110 deg. F. to allow the paint to dry or cure. The weight of paint applied is approximately 200 milligrams. This coat of paint provides protection for the stamp as well as improving the cosmetic appearance of the ball. This paint is typically a solvent based two component urethane paint with a solids content of about 38% by weight.

Details of New Ball Finishing Process

The new painting process uses one coat of paint in place of the two or more. This one coat of paint combines the features of the two coats it replaces. It provides the color, via optical brightener, and the cosmetic appearance. It would also provide protection for the stamp if the stamp is applied to the ball first. This one coat of paint also eliminates the manual handling associated with applying the top coat of paint as it is applied using our automatic paint line, thus providing significant savings.

The one coat of paint is applied in a setup where the balls are automatically loaded from gondolas onto spindles. The ball and spindle pass in front of the paint guns as the spindle rotates to insure all surfaces of the ball are painted. Approximately 200 milligrams of wet paint are applied to each ball. The balls then travel through a drying (or curing) oven where the paint is allowed to dry. The drying process takes about 4 minutes. After the balls exit the oven, they are knocked off the spindles into a gondola. The balls are then typically sent through the stamping process, but could also

have been stamped prior to painting. This painting setup is identical to the conventional prior art process used to apply the water based primer paint.

Details of the Stamping Process

The stamping process utilizes a pad printing process to apply lettering, symbols, or numbers to the golf ball as required. Printing involves the precise application of ink to the ball and may be either single or multi-color. The pad printing process involves the transfer of ink from a cliché, or image carrier, to the substrate, or golf ball, via a flexible (usually silicone) pad.

Traditionally, the stamping ink is air dried and thermoplastic in nature. It is applied on top of a layer of primer paint and then an additional layer of paint is applied on top of the ink. The nature of this ink forces the manufacturer to handle each ball carefully to avoid damaging the printed area.

The new stamping process uses a durable ultraviolet (UV) curable ink. The ink can be applied directly to the ball using no primer paint, on top of a layer of primer paint, or even on top of the outer layer of paint, which may be a single layer of paint. Because of the durable nature of the UV ink, balls can be handled in bulk in place of the careful manual handling required with traditional inks.

This new process offers a high level of stamp durability immediately after the ink is cured. This allows balls to be handled in bulk containers after printing, which can then be moved directly to paint lines or packaging lines. This eliminates the practice of an operator manually loading each printed ball to paint spindles or trays in order to avoid damaging the printed area.

While in the foregoing specification a detailed description of specific embodiments of the invention were set forth for the purpose of illustration, it will be understood that many of the details herein given can be varied considerably by those skilled in the art without departing from the spirit and scope of the invention.

We claim:

1. A golf ball consisting of a core, a cover, and a single coat of solvent-based transparent paint in contact with the cover, the coat of paint being the outermost coat of the golf ball and including an optical brightener, and indicia on the single coat of paint, the indicia comprising UV cured ink, which is chemically bonded to the coat of paint, the indicia being free of any protective coating.

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